

DEPARTMENT OF ~~//CONSUMER AND INDUSTRY SERVICES//~~**LABOR & ECONOMIC
GROWTH**

DIRECTOR'S OFFICE

CONSTRUCTION CODE

Filed with the Secretary of State on
These rules take effect on February 28, 2005

(By authority conferred on the director of the department of ~~//consumer and industry
services//~~**labor & economic growth** by section 4 of 1972 PA 230, MCL 125.1504, and
Executive Reorganization Order Nos. 1996-2 **and 2003-1**, MCL 445.2001 **and 445.2011**)

R 408.31061, R 408.31062, R 408.31063, R 408.31064, R 408.31065, R 408.31066, R
408.31070, of the Michigan Administrative Code are amended, R 408.31059, R 408.31060 and
R 408.31069 are added to the Code, and R 408.31071, R 408.31072, R 408.31073, R 408.31074,
R 408.31075, R 408.31076, R 408.31077, R 408.31078, R 408.31079, R 408.31080, R
408.31081, R 408.31082, R 408.31083, R 408.31084, R 408.31085, R 408.31086 of the code are
rescinded as follows:

PART 10
MICHIGAN UNIFORM ENERGY CODE

R 408.31059 Applicable code.

Rule 1059. Rules governing the energy efficiency for the design and construction of residential buildings shall be those contained in Chapter 11 of the 2003 International Residential Code. With the exceptions noted, Chapter 11 of the 2003 International Residential Code is adopted by reference in these rules. The Michigan uniform energy code is available for inspection or purchase at the Okemos office of the Michigan Department of Labor & Economic Growth, Bureau of Construction Codes and Fire Safety, 2501 Woodlake Circle, Okemos, Michigan 48864, at a cost as of the time of adoption of these rules of \$2.50.

R 408.31060 Scope.

Rule 1060. Sections N1101.1, N1101.2, N1101.2.1 and table N1101.2 of the code are amended to read as follows:

N1101.1. Scope. This chapter sets forth the energy efficiency standards for detached 1- and 2-family dwellings and multiple-single family dwellings. One- and 2-family dwellings and multiple-single family dwellings shall be designed and constructed as regulated by the code for energy efficiency.

Exceptions:

1. A detached 1- and 2-family dwelling or portion thereof that has an intended maximum rate of energy usage less than 3.4 Btu/h per square foot of floor space for all purposes.

2. Portions of a detached 1- and 2-family dwelling that is not heated or mechanically cooled.

October 14, 2004

3. An existing detached 1-and 2-family dwelling, other than replacement fenestration as provided by section N1102.4.

4. An alteration of an existing detached 1-and 2-family dwelling.

5. A detached 1-and 2-family dwelling that is moved into or within a jurisdiction. A home manufactured pursuant to the Michigan premanufactured unit rules that is shipped for initial installation or initial assembly and installation on a building site shall not be considered a moved building.

6. Historical structures listed on the state or national historical register.

N1101.2 Compliance. Compliance with the code shall be demonstrated by meeting the requirements of the applicable sections and tables of the code. Where applicable, provisions are based on the climate zones where the building is located. The climate zone assignments are as set forth in table N1101.2 for the county in which the building is constructed. The permit applicant shall determine the method used to achieve compliance with the provisions of the code at the time of application for permit.

N1101.2.1 Detached 1-and-2 family dwellings. Compliance shall be demonstrated by 1 of the following:

1. Meeting the requirements of the code.
2. Meeting the requirements of the International Energy Conservation Code for detached 1- and 2-family dwellings.
3. Meeting the design, construction and certification requirements under the US EPA Energy Star Homes Program ®.
4. Meeting the design and construction requirements in conformance with the national Home Energy Rating System (HERS) guidelines with a score of 83 or better. A certificate indicating the score prepared by an accredited agency shall be filed with the code official.

**Table N1101.2
Climate Zones by County**

Zones		
1	2	3
Allegan	Alcona	Alger
Barry	Alpena	Baraga
Berrien	Antrim	Chippewa
Branch	Arenac	Delta
Calhoun	Bay	Dickinson
Cass	Benzie	Gogebic
Clinton	Charlevoix	Houghton
Eaton	Cheboygan	Iron
Genesee	Clare	Keweenaw
Gratiot	Crawford	Luce
Hillsdale	Emmet	Mackinac
Huron	Gladwin	Marquette
Ingham	Grand Traverse	Menominee
Ionia	Iosco	Ontonagon
Jackson	Isabella	Schoolcraft
Kalamazoo	Kalkaska	

Kent	Lake	
Lapeer	Leelanau	
Lenawee	Manistee	
Livingston	Mason	
Macomb	Mecosta	
Monroe	Midland	
Montcalm	Missaukee	
Muskegon	Montmorency	
Oakland	Newaygo	
Ottawa	Oceana	
Saginaw	Ogemaw	
Sanilac	Osceola	
Shiawassee	Oscoda	
St. Clair	Otsego	
St. Joseph	Presque Isle	
Tuscola	Roscommon	
Van Buren	Wexford	
Washtenaw		
Wayne		

R 408.31061 Definitions.//; A to C.//

Rule 1061. //(a) ~~“Addition” means new construction which is performed on an existing building and which increases the outside dimensions of the building.~~

~~–(b) “Air leakage” means a measure of the airtightness of a building shell caused by the pressure differential across the building envelope and the resulting airflow rate through the envelope.~~

~~–(c) “Alteration” means an enhancement, upgrading, or substantial change or modification, other than an addition or repair, to an existing structure.~~

~~–(d) “Annual fuel utilization efficiency” or “AFUE” means the efficiency rating of the heating plant model determined on average usage conditions as set out in the United States department of energy test procedures. It does not include electrical energy usage for gas or oil fired furnace or boiler usage.~~

~~–(e) “Band joist” means the peripheral edges of framed floors.~~

~~–(f) “Basement” means any floor level below the first story in a building, except that a floor level in a building that has only 1 floor level shall be classified as a basement, unless the floor level qualifies as a story above grade.~~

~~–(g) “Basement wall” means the opaque portion of a wall which encloses 1 side of a basement and which is partially or totally below grade.~~

~~–(h) “British thermal units” or “Btu” means approximately the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit at 39.2 degrees Fahrenheit and at 1 atmosphere of pressure.~~

~~–(i) “Building” means any structure which is occupied or intended to be occupied and which is for supporting or sheltering any occupancy. Portions of a building that are completely separated from other portions by fire separation walls are considered separate buildings.~~

~~–(j) “Building envelope” means the elements of a building that enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from spaces exempted by R 408.31070(6).~~

- ~~–(k) “Building official” means the person authorized under section 2 of Act No. 54 of the Public Acts of 1986, as amended, being §338.2302 of the Michigan Compiled Laws, to act on behalf of the responsible government agency for the administration of the applicable building code.~~
- ~~–(l) “Closed construction” means any building, building component, assembly, or system manufactured in a way that it cannot be inspected before installation at the building site without disassembly, damage, or destruction.~~
- ~~–(m) “Coefficient of performance” or “COP” means the ratio of useful energy produced by a refrigeration system or heat pump divided by the energy consumed. The higher the COP value, the more efficient the heat pump. A COP of 3, for example, means that three times as much heating energy was delivered as it took to power the heat pump.~~
- ~~–(n) “Conditioned floor area” means the horizontal projection of the portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system.~~
- ~~–(o) “Conditioned space” means space within a building that is provided with a positive heat supply.~~
- ~~–(p) “Cost effective” means that the economic benefits of the requirements of these rules will exceed the economic costs of the requirements of these rules based on a multiyear analysis. The analysis shall be in compliance with all of the following provisions:~~
 - ~~–(i) Take into consideration the perspective of a typical first-time new home buyer.~~
 - ~~–(ii) Consider benefits and costs over a 7-year time period.~~
 - ~~–(iii) Not assume fuel price increases in excess of the assumed general rate of inflation.~~
 - ~~–(iv) Assure that the buyer of a home who qualifies to purchase the home before the addition of the energy efficiency standards would still qualify to purchase the same home after the additional cost of the energy-saving construction features.~~
 - ~~–(v) Assure that the cost of principal, interest, taxes, insurance, and utilities will not be greater after the inclusion of the cost of the additional energy-saving construction features required by this part as opposed to the provisions of R 408.31001 to R 408.31055.~~
- ~~–(q) “Crawl space” means an area below the floor nearest grade that is supported by foundation walls and that does not qualify as a basement or story above grade due to restrictive height conditions.~~
- ~~–(r) “Crawl space wall” means the opaque portion of a wall which encloses a crawl space and which is partially or totally below grade.~~**//Section N1101.4 is added to the code to read as follows:**

N1101.4 Definitions. Definitions shall have the meanings as defined in the code.

R 408.31062 Fenestration//Definitions; E to G.

- ~~–Rule 1062. (a) “Energy” means the capacity for doing work and takes a number of forms that may be transformed from one into another, such as thermal (heat), mechanical (work), electrical, and chemical energy in customary units measured in kilowatt-hours (kWh) or British thermal units (Btu).~~
- ~~–(b) “Energy efficiency ratio” or “EER” means the ratio of net cooling capacity in Btu per hour to total rate of electric input, in watts, under designed operating conditions.~~
- ~~–(c) “Existing residential building” means a residential building erected before the effective date of R 408.31061, this rule, and R 408.31063 to R 408.31099, a residential building for which a valid building permit or certificate of occupancy has been issued, or a residential building for~~

which lawful construction commenced before the effective date of R 408.31061, this rule, and R 408.31063 to R 408.31099.

~~-(d) “Existing residential structure” means a residential structure erected before the effective date of R 408.31061, this rule, and R 408.31063 to R 408.31099, a residential structure for which a valid building permit or certificate of occupancy has been issued, or a residential structure for which lawful construction commenced before the effective date of R 408.31061, this rule, and R 408.31063 to R 408.31099.~~

~~-(e) “Fenestration” means all envelope component assemblies, including doors, which are in a building wall or ceiling, which are used for light transmittance, ingress, or egress, and which enclose conditioned space.~~

~~-(f) “Finished lower level” means a basement, or portion of a basement that is an enclosed area, which is suitable for year round use, including walls, floors, and ceilings, and which meets the requirements of the applicable building code for its intended use.~~

~~-(g) “Floors over unconditioned spaces” means a conditioned floor area that is over unconditioned space, outdoor air, or space exempted by R 408.31070(6)(a) and (b).~~

~~-(h) “Foundation wall” means a wall below the floor nearest grade that serves as a support for a wall or other structural part of a building.~~

~~-(i) “Grade plane” means a reference plane representing the average of finished ground level adjoining the building at all exterior walls. If the finished ground level slopes away from the exterior walls, then the reference plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than 6 feet from the building, between the building and a point 6 feet from the building.~~

~~-(j) “Gross area of exterior walls” means both of the following:~~

~~-(i) The normal projection of the building envelope insulated wall area that bounds interior space which is conditioned by an energy using system, including window, door, and opaque wall area.~~

~~-(ii) All opaque insulated wall areas which are exposed to outdoor air, unconditioned spaces, or spaces exempted by R 408.31070(6)(a) and (b) and which enclose a heated or mechanically cooled space including interstitial area between 2 heated or mechanically cooled spaces, including any of the following areas:~~

~~-(A) Between floor spandrels.~~

~~-(B) Peripheral edges of floors.~~

~~-(C) Window areas, including sash, and door areas.~~

~~-(k) “Ground source heat pump” means a mechanical device which is used for heating and cooling and which operates by using the earth as a heat source and heat sink. The system circulates fluid through a heat exchanger to extract or reject heat from a ground or water source.//~~

Rule 1062. Section N1101.3.2 of the code is amended to read as follows:

N1101.3.2. Fenestration. The *U*-factor of fenestration shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. The solar heat gain coefficient (SHGC) of fenestration shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Exception: Computer simulations by independent NFRC certified laboratories or approval under section 21 of 1972 PA 230, MCL 125.1521 are considered in compliance with this section.

N1101.3.2.3 R-values of fenestration products. Windows, doors and skylights shall be rated for thermal resistance based on the entire fenestration unit. The R-values of all fenestration products in a building shall be the reciprocal of the U-factor and meet the requirements set forth in table N1102.1. The U-factor may be converted to R values by using the inverse of the U-factor ($R \text{ value} = 1/U\text{-factor}$).

R 408.31063 Thermal performance criteria. //Definitions; H to M.

~~—Rule 1063. (a) “Heated slab” means slab on grade construction in which the heating elements or hot air distribution system is in contact with, or placed within, the slab or the subgrade.~~

~~—(b) “Heated space” means space within a building that is provided with a positive heat supply. Finished lower level space within a basement that has registers or heating devices designed to supply heat to the space is heated space.~~

~~—(c) “Heating degree day” or “HDD” means a unit of temperature and time that may be used to estimate fuel consumption, specify fuel consumption, and specify nominal heating load of a building in winter. A heating degree day accrues for every degree that mean outdoor temperature for a 24 hour period falls below 65 degrees Fahrenheit.~~

~~—(d) “Heating seasonal performance factor” or “HSPF” means the total heating output of a heat pump during its normal annual usage period for heating, in Btu, divided by the total electric energy input during the same period, in watt hours, as determined by 10 C.F.R. part 430, subpart B, test procedure.~~

~~—(e) “HVAC” means heating, ventilating, air conditioning.~~

~~—(f) “HVAC system equipment” means equipment that provides, in 1 single package or more (split system) factory assembled packages, a means for air circulation, air cleaning, or air cooling with controlled temperature. The cooling function may be either electrically operated or heat operated. The refrigerant condenser may be air, water, or evaporatively cooled. If the equipment is provided in more than 1 package, then the separate packages shall be designed by the manufacturer to be used together. The equipment may provide the heating function as a heat pump or through the use of electric or fossil fuel fired elements.~~

~~—(g) “Infiltration” means the uncontrolled inward air leakage which occurs through cracks and interstices in any building element and around windows and doors of a building and which is caused by the pressure effects of wind or temperature differences, or both, or appliance induced pressures.~~

~~—(h) “Insulation component” means insulating materials or combinations of insulating materials which are used in the course of construction as insulation, which are certified to meet ASTM C-578 standard, and which are in compliance with R 408.31071.~~

~~—(i) “Manufactured building” means any closed construction building, except for a mobile home, that is made or assembled in manufacturing facilities on or off the building site. The term also means any open construction building that is made away from the building site for installation or assembly and installation on the building site.~~

~~—(j) “Mobile home” means a factory assembled, movable dwelling which is designed and constructed to meet United States housing and urban development department (HUD) standards and to be towed on its own chassis that is comprised of the frame and wheels and which is distinguishable from other types of dwellings in that the standards to which it is built include provisions for its mobility on a chassis as a vehicle.//~~

Rule 1063. Thermal performance criteria. Tables N1102.1, N1102.1.1.1(1), and N1102.1.1.2 of the code are amended to read as follows:

TABLE N1102.1
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT
CRITERIA MINIMUM REQUIRED THERMAL PERFORMANCE (U-FACTOR AND
R-VALUE)

Exterior Enclosure		Zones		
		1	2	3
Wall Assemblies		R-21	R-21	R-21
Fenestration/Opening (area weighted average of the total area of fenestration units) ¹		U =0.35 (R= 2.85)		
Roof/Ceiling Assemblies ²		R-49	R-49	R-49
Floors over unconditioned spaces		R-21	R-21	R-21
Slab on grade construction ³		R-11	R-13	R-18
Crawl space walls ⁴		R-20	R-20	R-20
Basement walls	Continuous Insulation	R-10	R-10	R-15
	Cavity Insulation	R-11	R-11	R-19

¹ Fenestration units are required to meet this standard for the entire unit.

² Skylight U (1/R) factors are required to meet the fenestration requirements set forth in this table for fenestration/openings. Skylights are limited to 10% of the gross roof/ceiling area.

³ See section N1102.1.6 for additional installation criteria.

⁴ See section N1102.1.7 for additional installation criteria.

TABLE N1102.1.1.1(1)
MASS WALL PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS

BUILDING LOCATION		MASS WALL ASSEMBLY R-VALUE ^a (hr · ft ² · °F) / Btu	
Climate Zone	HDD	Exterior or integral insulation	Other mass walls
1	6,000-6,999	R-15.5	R-18.4
2	7,000-8,499	R-15.5	R-18.4
3	8,500-12,999	R-18.4	R-18.4

For SI: 1 (hr · ft² · °F)/Btu = 0.176 m² · K/W.

TABLE N1102.1.1.2
STEEL-FRAME WALL MINIMUM PERFORMANCE REQUIREMENTS (R-VALUE)

CLIMATE ZONES	HDD	EQUIVALENT STEEL-FRAME WALL CAVITY AND SHEATHING R-VALUE ^a
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		(hr ft ² °F) / Btu
1	6,000-6,999	R-13+R-10, R-19+R-9, R-25+R-8
2	7,000-8,499	R-13+R-10, R-19+R-9, R-25+R-8
3	8,500-12,999	R-13+R-10, R-19+R-9, R-25+R-8

For SI: 1 (hr · ft² · °F)/Btu = 0.176 m² · K/W.

a. The cavity insulation *R*-value requirement is listed first, followed by the sheathing *R*-value requirement.

R 408.30164 **Replacement fenestration.**//Definitions; O to R.

~~—Rule 1064. (a) “Occupied” means a building in which a person resides or which is intended, arranged, or designated to be occupied.~~

~~—(b) “Opaque area” means any exposed area of a building envelope that encloses conditioned space, except openings for windows, skylights, doors, and building service systems.~~

~~—(c) “Opaque exterior building envelope” means all exposed areas of a building envelope that enclose conditioned space, except openings for windows, skylights, doors, and building service systems.~~

~~—(d) “Open construction” means any building, building component, assembly, or system that is manufactured in a way that it can readily be inspected at the building site without disassembly, damage, or destruction.~~

~~—(e) “Openings” means fenestration areas that penetrate and comprise part of the gross area of exterior walls (jamb size).~~

~~—(f) “Overall thermal transmittance” or “U_e” means the area-weighted average of the thermal transmittance values of all material, including framing and fenestration, as well as the component assemblies, such as air film, insulation, drywall, framing, and glazing, that make up the building envelope.~~

~~—(g) “Permit” means an official document or certificate which is issued by the governmental subdivision and which authorizes performance of a specified activity.~~

~~—(h) “Positive heat supply” means either of the following:~~

~~—(i) Heat directly supplied to a space by design, such as a supply register, radiator, or heating element.~~

~~—(ii) Heat indirectly supplied to a space by convection from the energy-consuming systems if the energy-consuming systems are not insulated and continually maintain air temperature within the space of 50 degrees Fahrenheit or higher during normal operation.~~

~~—(i) “Prescriptive requirements” means specified values or rules representing the requirements that must be met to achieve compliance with R 408.31073, R408.31074 to R 408.31081, R 408.31082 and 408.31083.~~

~~—(j) “Renewable energy sources” mean sources of energy, excluding minerals, derived from incoming solar radiation, including any of the following:~~

~~—(i) Natural day light and photosynthetic processes.~~

~~—(ii) Phenomena resulting from natural day light and photosynthetic processes, including wind, waves, and tides and lake or pond thermal differences.~~

~~—(iii) The internal heat of the earth, including nocturnal thermal exchanges.~~

~~—(k) “Repair” means the act or process of restoring to original soundness, including, but not limited to, any of the following:~~

~~—(i) Redecorating.~~

~~—(ii) Refinishing.~~

~~—(iii) Nonstructural repairs.~~

~~—(iv) Maintenance repairs or replacement of existing fixtures, systems, or equipment.~~

- ~~-(l) “Residential buildings” means any of the following:~~
- ~~-(i) Detached 1 and 2 family dwellings.~~
- ~~-(ii) Other residential buildings that are 3 stories or less in height.~~
- ~~-(iii) A building or structure which is incidental to the use of the main residential building and which is located within the apartment complex or subdivision.~~
- ~~-(m) “Roof/ceiling assembly” means a roof/ceiling assembly and all components of the roof/ceiling envelope through which heat flows and creates a building transmission heat loss or gain where the assembly is exposed to outdoor air and encloses a heated or mechanically cooled space. The gross area of a roof/ceiling assembly consists of the total interior surface of the assembly, including skylights exposed to the heated or mechanically cooled space.~~
- ~~-(n) “R value” means the measure of thermal resistance, that is, how well a material or series of materials resists the flow of heat. R value is the reciprocal of thermal transmittance ($R=1/U$).//~~

Rule 1064. Section N1102.4 of the code is amended to read as follows:

N1102.4. Replacement fenestration. Where some or all of an existing fenestration unit is replaced with an entirely new replacement fenestration product, including frame, sash and glazed portion, in an existing building, the replacement fenestration shall have a U-factor that does not exceed the maximum fenestration U-factor and an SHGC that does not exceed the maximum fenestration SHGC in table N1102.5. Replacement skylights and roof windows shall be permitted to have a maximum U-factor of 0.60. The replacement fenestration products shall also satisfy the air leakage requirements of section N1101.3.2.2.

R 408.31065 Prescriptive path for additions and window replacements.//Definitions; S to T.

- ~~Rule 1065. (a) “Sash crack” means the sum of all weather stripped perimeters of window sashes, skylights, and doors. The sum shall be based on overall dimensions of the weatherstripped perimeters of window sashes, skylights, and doors, expressed in feet. If a portion of one sash perimeter overlaps a portion of another sash perimeter, then the length of the overlapping portions is counted once.~~
- ~~-(b) “Seasonal energy efficiency ratio” or “SEER” means the total cooling output of an air conditioner during its normal annual usage period for cooling, in Btu/h, divided by the total electric energy input during the same period, in watt hours, as determined by 10 C.F.R. part 430, subpart B, test procedure.~~
- ~~-(c) “Slab on grade floor insulation” means insulation around the perimeter of the floor slab or its supporting foundation when the top edge of the floor perimeter slab is above the finished grade or 12 inches or less below the finished grade.~~
- ~~-(d) “Story” means the portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above.~~
- ~~-(e) “Story above grade” means any story that has its finished floor surface entirely above grade, except that a basement shall be considered as a story above grade if the finished surface of the floor above the basement is any of the following:~~
 - ~~-(i) More than 6 feet above grade plane.~~
 - ~~-(ii) More than 6 feet above the finished ground level for more than 50% of the total building perimeter.~~
 - ~~-(iii) More than 12 feet above the finished ground level at any point.~~
- ~~-(f) “Structure” means that which is built or constructed or a portion of something that is built or constructed.~~

- ~~-(g) “System” means a combination of central or terminal equipment or components, or controls, accessories, interconnecting means, and terminal devices, by which energy is transformed so as to perform a specific function, such as HVAC.~~
- ~~-(h) “Thermal resistance” or “R” means a measure of the ability to retard the flow of heat. The R-value is the reciprocal of thermal transmittance ($R=1/U$).~~
- ~~-(i) “Thermal transmittance” or “U” means time rate of heat flow through a body or assembly that is located in 2 different environments, expressed in Btu per (hour)(square foot)(degree Fahrenheit). The U-value applies to all of the following:~~
 - ~~-(i) The combination of different materials used in series along the heat flow path.~~
 - ~~-(ii) Single materials that comprise a building section.~~
 - ~~-(iii) Cavity air spaces.~~
 - ~~-(iv) Surface air films on both sides.~~

Rule 1065. Section N1102.5 and table N1102.5 are added to the code to read as follows:

~~N1102.5 Prescriptive path for additions and window replacements. As an alternative to demonstrating compliance with section N1105 or N1102, additions with a conditioned floor area less than 500 square feet (46.5m²) to existing single-family residential buildings and structures shall meet the prescriptive envelope component criteria in table 1102.5 for the designated heating degree days (HDD) applicable to the location. The *U*-factor of each individual fenestration product (windows, doors and skylights) shall be used to calculate an area-weighted average fenestration product *U*-factor for the addition, which shall not exceed the applicable listed values in table N1102.5. For additions, other than sunroom additions, the total area of fenestration products shall not exceed 40 percent of the gross wall and roof area of the addition. The *R*-values for opaque thermal envelope components shall be equal to or greater than the applicable listed values in table N1102.5. Replacement fenestration products (where some or all of an existing fenestration unit is replaced with an entire new replacement unit, including the frame, sash and glazing) shall meet the prescriptive fenestration *U*-factor criteria in table N1102.5 for the designated HDD applicable to the location.~~

Conditioned sunroom additions shall maintain thermal isolation; shall not be used as kitchens or sleeping rooms; and shall be served by a separate heating or cooling system, or be thermostatically controlled as a separate zone of the existing system.

Exception: Replacement skylights shall have a maximum *U*-factor of 0.60 when installed in any location above 1,999 HDD.

**TABLE N1102.5
PRESCRIPTIVE ENVELOPE COMPONENT CRITERIA
ADDITIONS TO AND REPLACEMENT WINDOWS FOR EXISTING
DETACHED 1- AND 2-FAMILY DWELLINGS**

HEATING DEGREE DAYS	MAXIMUM	MINIMUM					
	<u>Fenestration</u> U-factor ^e	Ceiling R-value ^{a,e}	Wall R-value ^c	<u>Floor</u> R-value	Basement wall R-value ^b	Slab perimeter R-value and depth ^c	Crawl space wall R-value ^d
6,000 - 8,499	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20

8,500 - 12,999	0.35	R-49	R-21	R-21	R-19	R-18, 4 ft.	R-20
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For SI: 1 foot = 304.8 mm.

a. "Ceiling *R*-value" shall be required for flat or inclined (cathedral) ceilings. Floors over outside air shall meet "Ceiling *R*-value" requirements.

b. Basement wall insulation shall be installed in accordance with section 502.2.1.6.

c. Slab perimeter insulation shall be installed in accordance with section 502.2.1.4. An additional R-2 shall be added to "Slab perimeter *R*-value" in the table if the slab is heated.

d. "Crawl space wall *R*-value" shall apply to unventilated crawl spaces only. Crawl space insulation shall be installed in accordance with section 502.2.1.5.

e. Sunroom additions shall be required to have a maximum fenestration *U*-factor of 0.50 in locations with 2,000 - 12,999 HDD. In locations with 0-5,999 HDD, the minimum ceiling *R*-value shall be R-19 and the minimum wall *R*-value shall be R-13. In locations with 6,000 - 12,999 HDD, the minimum ceiling *R*-value shall be R-24 and the minimum wall *R*-value shall be R-13.

R 408.31066 **Building design**//~~Definitions; U to Z.~~

~~Rule 1066. (a) "Unconditioned space" means space within a building that is not conditioned space.~~

~~(b) "Walls" means the portions of the building envelope that are vertical or tilted at an angle of 30 degrees or less from the vertical plane.~~

~~(c) "Warm air furnace" means a self-contained, indirect fired or electrically heated furnace that supplies heated air through ducts to spaces that require it.~~

~~(d) "Zone 1" means the following counties:~~

~~(i) Allegan.~~

~~(ii) Barry.~~

~~(iii) Berrien.~~

~~(iv) Branch.~~

~~(v) Calhoun.~~

~~(vi) Cass.~~

~~(vii) Clinton.~~

~~(viii) Eaton.~~

~~(ix) Genesee.~~

~~(x) Gratiot.~~

~~(xi) Hillsdale.~~

~~(xii) Huron.~~

~~(xiii) Ingham.~~

~~(xiv) Ionia.~~

~~(xv) Jackson.~~

~~(xvi) Kalamazoo.~~

~~(xvii) Kent.~~

~~(xviii) Lapeer.~~

~~(xix) Lenawee.~~

~~(xx) Livingston.~~

~~(xxi) Macomb.~~

~~(xxii) Monroe.~~

~~(xxiii) Montcalm.~~

~~(xxiv) Muskegon.~~

~~(xxv) Oakland.~~

- ~~-(xxvi) Ottawa.~~
- ~~-(xxvii) Saginaw.~~
- ~~-(xxviii) Sanilac.~~
- ~~-(xxix) Shiawassee.~~
- ~~-(xxx) St. Clair.~~
- ~~-(xxxi) St. Joseph.~~
- ~~-(xxxii) Tuscola.~~
- ~~-(xxxiii) Van Buren.~~
- ~~-(xxxiv) Washtenaw.~~
- ~~-(xxxv) Wayne.~~
- ~~-(e) "Zone 2" means the following counties:~~
 - ~~-(i) Alcona.~~
 - ~~-(ii) Alpena.~~
 - ~~-(iii) Antrim.~~
 - ~~-(iv) Arenac.~~
 - ~~-(v) Bay.~~
 - ~~-(vi) Benzie.~~
 - ~~-(vii) Charlevoix.~~
 - ~~-(viii) Cheboygan.~~
 - ~~-(ix) Clare.~~
 - ~~-(x) Crawford.~~
 - ~~-(xi) Emmet.~~
 - ~~-(xii) Gladwin.~~
 - ~~-(xiii) Grand Traverse.~~
 - ~~-(xiv) Iosco.~~
 - ~~-(xv) Isabella.~~
 - ~~-(xvi) Kalkaska.~~
 - ~~-(xvii) Lake.~~
 - ~~-(xviii) Leelanau.~~
 - ~~-(xix) Manistee.~~
 - ~~-(xx) Mason.~~
 - ~~-(xxi) Mecosta.~~
 - ~~-(xxii) Midland.~~
 - ~~-(xxiii) Missaukee.~~
 - ~~-(xxiv) Montmorency.~~
 - ~~-(xxv) Newaygo.~~
 - ~~-(xxvi) Oceana.~~
 - ~~-(xxvii) Ogemaw.~~
 - ~~-(xxviii) Osceola.~~
 - ~~-(xxix) Oscoda.~~
 - ~~-(xxx) Otsego.~~
 - ~~-(xxxi) Presque Isle.~~
 - ~~-(xxxii) Rosecommon.~~
 - ~~-(xxxiii) Wexford.~~
- ~~-(f) "Zone 3" means the following counties:~~
 - ~~-(i) Alger.~~

- ~~-(ii) Baraga.~~
- ~~-(iii) Chippewa.~~
- ~~-(iv) Delta.~~
- ~~-(v) Dickinson.~~
- ~~-(vi) Gogebie.~~
- ~~-(vii) Houghton.~~
- ~~-(viii) Iron.~~
- ~~-(ix) Keweenaw.~~
- ~~-(x) Luce.~~
- ~~-(xi) Mackinac.~~
- ~~-(xii) Marquette.~~
- ~~-(xiii) Menominee.~~
- ~~-(xiv) Ontonagon.~~
- ~~-(xv) Schoolcraft.~~//

Rule 1066. Sections N1105.1, N1105.1.1, N 1105.1.2 and N1105.1.3 are added to the code to read as follows:

N1105.1 Building design. Residential design by systems analysis. A building designed in accordance with this section is considered in compliance with the code if the calculated heating energy consumption is not more than that of a standard design building envelope designed in accordance with the code. The use of this compliance method is at the election of the permit applicant. For a proposed alternate building design to be considered similar to the standard design, the proposed alternate building design shall be the same as the standard design for all of the following:

1. Floor area.
2. Thermal envelope area.
3. Exterior design conditions.
4. Occupancy.
5. Climate data.
6. Usage operational schedule.

N1105.1.1 Standard building design criteria. The standard building design criteria shall include the following:

1. Gas and oil-fired heating source efficiency rating of 78% AFUE.
2. An air changes per hour (ACH) rate of 0.55 for the purpose of calculation only.
3. For reduced ACH levels, documentation of a post-construction blower-door test shall be provided to the code official.
4. A simplified heating degree day (HDD) approach for the appropriate zone, as follows:
 - a. Zone 1 6900 HDD.
 - b. Zone 2 7800 HDD.
 - c. Zone 3 9300 HDD.

Exception: The typical meteorological year (TMY), or its ersatz equivalent, from the national oceanic and atmospheric administration (NOAA) or an approved equivalent, for the closest available location, may be used for the proposed alternative design.

N1105.1.2 Analysis method. The analysis methodology or calculation tool used for comparison of the heating energy usage of the standard and the proposed alternative building design shall be the same.

N1105.1.3 Analysis Report. A heating energy analysis comparison shall be submitted to the code official including all of the following information:

- a. The design criteria used to develop the standard design and the proposed alternative design.
- b. A detailed technical comparison of the 2 building and system designs.
- c. The data used in, and resulting from, the comparative analysis to verify that both the analysis and the design meet the criteria of this section and sections N1105.1 to N1105.2.

R 408.31069 Renewable energy source analysis.

Rule 1069. Section N1106.1 is added to the code to read as follows:

N1106.1 Renewable energy source analysis. A building designed to use a renewable energy source for all or part of its energy source shall be designed and constructed in compliance with the requirements of this section.

Exception: The renewable energy may be excluded from the total heating energy consumption allowed for the building.

- a. The renewable energy shall be derived from a specific collection, storage, or distribution system.
- b. The heating energy derived from renewable sources and the reduction in conventional heating energy requirements shall be separately identified from the overall building energy use.
- c. Supporting documentation on the basis of the performance estimates for the renewable energy sources shall be submitted to the code official.

R 408.31070 Heating energy analysis comparison report. ~~//Code title, intent, compliance, and exemption; adoption of standards by reference.~~

~~—Rule 1070. (1) These rules shall be known as the Michigan uniform energy code.~~

~~—(2) The intent of the Michigan uniform energy code, referred to as “the code,” is to provide cost-effective minimum energy conservation requirements when designing or building new residential buildings or structures. The code is not intended to be, nor should it be construed as, the optimization of energy conserving practices. The code provides flexibility to permit the use of innovative approaches and techniques to achieve the effective utilization of energy.~~

~~—(3) Residential buildings shall be designed and constructed to comply with either the requirements of R 408.31073, R 408.31074 to R 408.31081, R 408.31082 and R 408.31083 or the requirements of R 408.31084, R 408.31085 and R 408.31086.~~

~~—(4) Residential buildings that have more than 1 occupancy shall conform each portion of the building to the requirements for the occupancy within that portion. If minor accessory uses do not occupy more than 10% of the area of any floor of a building, then the major use shall be considered the building occupancy.~~

~~—(5) Compliance with the code shall be achieved by 1 of the methods specified in this subrule. The decision of which method to use to achieve compliance with the code shall be the sole discretion of the builder and shall be accepted by the building official. The methods are as follows:~~

~~—(a) A prescriptive approach for insulating components as required in R 408.31073, R 408.31074 to R 408.31081, R 408.31082 and R 408.31083.~~

~~—(b) A systems approach for the entire building performance as required in R 408.31084, R 408.31085, and R 408.31086.~~

- ~~-(6) All of the following buildings are exempt from the code:~~
 - ~~-(a) A residential building or portion of a residential building that has an intended maximum rate of energy usage less than 3.4 Btu/h per square foot of floor area for all purposes.~~
 - ~~-(b) A residential building or portion of a residential building that is not heated or mechanically cooled.~~
 - ~~-(c) An existing building.~~
 - ~~-(d) An alteration of any existing residential building or structure or portion of a residential building.~~
 - ~~-(e) An addition to any existing residential building or structure.~~
 - ~~-(f) An existing residential building moved into or within the jurisdiction. A manufactured building that is shipped for initial installation or initial assembly and installation on a building site shall not be considered a moved structure.~~
- ~~-(7) A building, other than a residential building, shall be designed and constructed to comply with the requirements of ASHRAE 90A-1980 and 90B-1975.//~~

Rule 1070. Sections N1107.1, N1107.1.1, N1107.2, abbreviated report form N1107.1, and table N1107.1 are added to the code to read as follows:

N1107.1 Heating energy analysis comparison report. A heating energy comparison report shall be submitted to the code official to include both of the following information:

- 1. A basic description of the proposed alternate building design and any exceptions to the standard design criteria.**
- 2. Abbreviated report form N1107.1, comparing the alternative house design with a standard design house complying with the provisions of this chapter through the systems analysis method.**

Abbreviated Report Form N1107.1 **Heating Energy Analysis Comparison Report**

Builder's Name:
Project Address:
City/Township/County:

PROPOSED ALTERNATIVE HOUSE		STANDARD DESIGN HOUSE	
ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS	ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS
$A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 + A_3 / R_3 =$ Total Roof/Ceiling Area	Line 1	$\text{_____} \times 0.0204 =$ Total Roof/Ceiling Area (all zones)	Line A
GROSS WALL		GROSS WALL	
Opaque Wall (Does not include band joist, windows, doors, etc.) $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$	Line 2		
Band Joist $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____ } =$	Line 3		
Fenestration and Doors, Windows $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 + A_3 / R_3 =$	Line 4		
Doors $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$	Line 5		
Other $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____ } =$ Total Gross Wall Area	Line 6		
GROSS WALL SUBTOTAL A/R (Lines: 2+3+4+5+6)	Line 7	$\text{_____} \times 0.093 =$ Total Gross Wall Area (all zones)	Line B

Abbreviated Report Form N1107.1
Heating Energy Analysis Comparison Report
Continued

FOUNDATION/FLOOR	SUBTOTALS	FOUNDATION/FLOOR	SUBTOTALS
Floors Over Unconditioned Spaces		Floors Over Unconditioned Spaces	
A _____ /R _____ = A/R _____ =	Line 8	_____ x 0.0204 = (all zones)	Line C
Slab on Grade Floors (Area = Perimeter x 2')		Slab on Grade (Unheated)	
A _____ /R _____ = A/R _____ =	Line 9	_____ x $\begin{matrix} Z_1 0.0909 \\ Z_2 0.0769 = \\ Z_3 0.050 \end{matrix}$	Line D
		Slab on Grade (Heated)	
		_____ x $\begin{matrix} Z_1 0.0769 \\ Z_2 0.0667 = \\ Z_3 0.050 \end{matrix}$	Line E
Crawl Space Walls (Area: Top foundation wall to average finished grade)		Crawl Space	
A _____ /R _____ = A/R _____ =	Line 10	_____ x 0.050 = (all zones)	Line F
Basement Walls (Area: Top foundation wall to average finished grade)		Basement Walls	
A ₁ _____ /R ₁ _____ = A ₁ /R ₁ _____		_____ x $\begin{matrix} Z_1 0.090 \\ Z_2 0.090 = \\ Z_3 0.055 \end{matrix}$	Line G
A ₂ _____ /R ₂ _____ = A ₂ /R ₂ _____			
A ₁ /R ₁ + A ₂ /R ₂ =	Line 11		
Basement Windows			
A _____ /R _____ = A/R _____ =	Line 12		
Total Gross Basement Wall Area			
FOUNDATION/FLOOR SUBTOTAL A/R (Lines: 8+9+10+11+12)	Line 13	FOUNDATION/FLOOR SUBTOTAL A/R (Lines: C+D+E+F+G)	Line H
PROPOSED ALTERNATIVE HOUSE SUB-TOTAL A/R (Lines: 1+7+13)	Line 14	STANDARD DESIGN HOUSE SUB-TOTAL A/R (Lines: A+B+H)	Line I
HEATING EQUIPMENT EFFICIENCY (If the same as Standard House, go to line 16 or 17)		HEATING EQUIPMENT EFFICIENCY	
(Oil or Gas Fired) AFUE: _____%		(Oil or Gas Fired) AFUE: 78%	
Line 14: _____ = Adjusted A/R =		Line I: _____ = Adjusted A/R =	
AFUE: 0.____	Line 15	AFUE: 0.78	Line J
AIR LEAKAGE RATE (If the same as Standard House, go to line 17)		AIR LEAKAGE RATE	

$\frac{\text{ACH}}{\text{Air Changes per Hour}} \times \frac{\text{ft}^3}{\text{Volume of House}} \times 0.018 =$	<div>Line 16</div>	$0.55 \text{ ACH} \times \frac{\text{ft}^3}{\text{Volume of House}} \times 0.018 =$	<div>Line K</div>
PROPOSED ALTERNATIVE HOUSE TOTAL (Lines: 15+16)		STANDARD DESIGN LIMIT TOTAL (Lines: J+K)	
Equal to or less than line L to pass	<div>Line 17</div>		<div>Line L</div>

N1107.1.1 Alternative design constants. The alternative design constants of table N1107.1 may be used for the specific site weather data (heating degree days) for the proposed alternative design.

Table N1107.1
Alternative Standard Design Constants (1/r) for Systems Analysis Approach

Heating Degree Days	6000 – 6499	6500 – 6999	7000 – 7499	7500 – 7999	8000 – 8499	8500 – 8999	9000 +
Roof/Ceiling	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204
Gross Wall	0.093	0.093	0.093	0.093	0.093	0.093	0.093
Foundation/floor Floor over unconditioned space	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204
Slab on grade							
Unheated slab	0.0909	0.0909	0.0769	0.0769	0.0769	0.050	0.050
Heated Slab	0.0769	0.0769	0.0667	0.0677	0.0667	0.050	0.050
Crawl space	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Basement wall	0.0909	0.0909	0.0909	0.0909	0.0909	0.0555	0.0555

N1107.2 Compliance. The proposed alternative design shall be determined to be in compliance when the proposed alternative house A/R total (line 14 or line 17 of abbreviated report form N1107.1) is less than or equal to the standard design house (line I or line L of abbreviated report form N1107.1).

~~R 408.31071 Rescinded.//Materials and equipment.; identification; insulation installation, maintenance, and labeling; fenestration rating, certification, and labeling.~~

~~Rule 1071. (1) As required by the code, materials and equipment shall be identified to show compliance with the code.~~

~~(2) Either each piece of building envelope insulation that is 12 inches or more in width shall have a manufacturer applied thermal resistance (R) identification mark or the insulation installer shall provide a signed and dated certification for the insulation installed in each element of the building envelope. The certification shall list the type of insulation, the manufacturer, and the R-value. For blown in or sprayed insulation, the installer shall also provide all of the following information:~~

- ~~-(a) the initial installed thickness.~~
- ~~-(b) the settled thickness.~~
- ~~-(c) the coverage area.~~
- ~~-(d) the number of bags installed.~~

~~The installer shall provide the certification to the building official.~~

~~(3) The amount of air leakage of premanufactured fenestration products, including windows, doors, and skylights in locations separating outdoor ambient conditions or exempted portions of the building from interior spaces that are heated or mechanically cooled, shall be labeled or certified by the manufacturer not to be more than .37 cubic feet per minute (CFM) of air leakage per lineal foot of sash crack perimeter at an air pressure of 1.56 pounds per square foot (PSF) (25MPH) using ASTM E283 procedures. Certified or labeled values shall be accepted in determining compliance with the building envelope requirements of the code. Custom installed~~

windows and doors that are not premanufactured are exempt from product rating requirements for air leakage. The installation of custom fenestration products shall comply with R 408.31082.

~~–(4) Roof/ceiling, floor, and wall cavity insulation shall be installed so that the manufacturer's R-value identification mark can be readily inspected. For roof/ceiling insulation, the thickness of the insulation that is either blown in or sprayed by thickness shall be identified by markers that are labeled in inches. The markers shall be installed in not less than 5 locations in each separate attic area. Four markers shall be evenly spaced around the perimeter of the space and 1 shall be located near the access opening. The markers shall be affixed to the truss or joist/rafter framing before application of the loose-fill insulation and shall be marked with the minimum initial installed thickness recommended by the loose-fill manufacturer and also, when given on the manufacturer's label, shall mark the minimum settled thickness. The markers shall be installed to accurately indicate the depth of installed insulation.~~

~~–(5) An installer shall install the loose-fill insulation at a uniform depth throughout the open area of the attic. The depth shall equal or exceed the minimum initial installed thickness shown on the markers. The minimum bags per 1,000 square feet recommended by the manufacturer shall be installed.~~

~~–(6) All needed maintenance actions that must be performed on a regular basis shall be clearly stated and incorporated on a readily accessible label. The label shall be easily accessed and indicate, by title or publication number, the manual for the particular model and type of product that provides operation and maintenance requirements and instructions. Maintenance instructions shall be provided for any equipment that requires preventive maintenance for efficient operation.~~

~~–(7) R-values of fenestration products, including windows, doors, and skylights, shall be determined from the center of the unit or glass by an accredited independent laboratory and labeled or shall be certified by the manufacturer or fabricator. Labeled or certified values shall be accepted for purposes of determining compliance with the building envelope requirements of the code.//~~

R 408.31072 Rescinded.//Alternate materials, method of construction, design, or insulating systems.

~~–Rule 1072. The code is not intended to preclude the use of any material, method of construction, design, or insulating system not specifically mentioned in the code if the material, method of construction, design, or insulating system has been approved by the building official as meeting the intent of the code.//~~

R 408.31073 Rescinded.//Residential building design by prescriptive approach; building envelope requirements.

~~–Rule 1073. (1) This rule applies to residential buildings that are to be heated or mechanically cooled and are designed or constructed in accordance with this rule, R 408.31074 to R 408.31081, R 408.31082 and 408.31083.~~

~~–(2) The requirements in R 408.31074 to R 408.31081 are not intended to be limiting. Methods of construction that combine insulating materials may be used if documentation is submitted to the building official indicating the thermal resistance value (R) of the total insulation materials. The documentation shall be in accordance with accepted engineering practice. Documentation submitted by a person licensed under article 24 of Act No. 299 of the Public Acts of 1980, as~~

amended, being §339.2401 et seq. of the Michigan Compiled Laws, need not be prepared, sealed, or submitted by an architect, professional engineer, or other consultant.

—(3) The design shall not create conditions of accelerated deterioration from moisture condensation. In all frame walls, floors, and ceilings not ventilated to allow moisture to escape, an approved vapor retarder that has a maximum perm rating of 1.0 shall be used on the warm-in-winter side of the thermal insulation.//

R 408.31074 **Rescinded.**//Building component criteria; walls.

—Rule 1074. (1) The thermal resistance value (R) of the insulation for the exterior walls and band joists comprising the building envelope above the foundation wall shall not be less than the value specified in table 1074, as follows:

—(a) R13 for zone 1.

—(b) R15 for zone 2.

—(c) R19 for zone 3.

—(2) Table 1074 reads as follows:

Table 1074
Prescriptive Compliance Approach
Building Envelope Insulation Criteria

Building Component	Zone 1	Zone 2	Zone 3
R 408.31074 Walls	R13	R15	R19
R 408.31075 Fenestration/openings	R1.9	R1.9	R1.9
Up to and including 15% gross exterior wall area			
Over 15% and including 20% gross exterior wall area	R2.5	R2.5	R2.5
Over 20% gross exterior wall area	Refer to building envelope opening allowance trade-off options (R408.31083)		
R 408.31076 Roof/ceiling	R30	R38	R38
Skylights follow fenestration requirements for R values and are limited to 10% of gross roof/ceiling area			
R 408.31077 Floors over unconditioned spaces (including outdoor overhangs)	R21	R30	R30
R 408.31078 Slab on grade floors			
Unheated slabs	R5	R5	R5
Heated slabs	R10	R10	R10
R 408.31079 Crawl space walls	R5	R5	R5
R 408.31080 Finished lower level walls—	R5	R5	R5
R 408.31081 Exposed basement walls (More than 7% of the gross exterior wall area)	R5	R5	R5

//

R 408.31075 **Rescinded.**//Building component criteria; fenestration.

~~Rule 1075. All of the following provisions apply to fenestration:~~

- ~~–(1) Openings, including doors, in the exterior building envelope up to and including 15% of gross exterior wall area shall have a thermal resistance R-value that is not less than the value specified in table 1074, being R1.9 for zone 1, zone 2, and zone 3.~~
- ~~–(2) If openings, including doors, in the exterior building envelope exceed 15% up to and including 20% of gross exterior wall area, they shall have a thermal resistance R-value that is not less than the value specified in table 1074, being R2.5 for zone 1, zone 2, and zone 3.~~
- ~~–(3) If openings, including doors, in the exterior building envelope exceed 20% of the gross area of exterior walls, then the requirements of R 408.31083 shall apply.//~~

R 408.31076 **Rescinded.**//Building component criteria; roof/ceiling.

~~Rule 1076. The thermal resistance value (R) of the insulation for the roof/ceiling assembly comprising the building envelope shall not be less than the value specified in table 1074, as follows:~~

- ~~–(a) R30 for zone 1.~~
- ~~–(b) R38 for zone 2 and zone 3.//~~

R 408.31077 **Rescinded.**//Building component criteria; floors over unconditioned space.

~~Rule 1077. The thermal resistance value (R) of the insulation for floors over unconditioned spaces comprising the building envelope, including outdoor overhangs shall not be less than the value specified in table 1074, as follows:~~

- ~~–(a) R21 for zone 1.~~
- ~~–(b) R30 for zone 2 and zone 3.//~~

R 408.31078 **Rescinded.**//Building component criteria; slab-on-grade floors.

~~Rule 1078. All of the following provisions apply to slab-on-grade floors:~~

- ~~–(a) The thermal resistance value (R) of the insulation around the perimeter of the floor comprising the building envelope shall be not less than the value specified in table 1074, as follows:~~
 - ~~–(i) R5 for unheated slabs for zone 1, zone 2, and zone 3.~~
 - ~~–(ii) R10 for heated slabs for zone 1, zone 2, and zone 3.~~
- ~~–(b) Insulation shall be placed around the perimeter of the floor slab or its supporting foundation when the top edge of the floor perimeter slab is above the finished grade or 12 inches or less below the finished grade.~~
- ~~–(c) The insulation shall extend downward from the elevation of the top of the slab for a minimum distance of 24 inches or downward to at least the bottom of the slab and then horizontally to the interior or exterior for a minimum total distance of 24 inches.~~
- ~~–(d) The insulation shall be of an approved type.~~
- ~~–(e) Horizontal insulation extending outside of the foundation shall be covered by a protective material or by soil that is a minimum of 10 inches thick.~~
- ~~–(f) The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree angle away from the exterior wall.//~~

R 408.31079 Rescinded.//Building component criteria; crawl space walls.

~~Rule 1079. The exterior walls of crawl spaces comprising the building envelope and below uninsulated floors shall have insulation that has a thermal resistance value (R) of not less than R5 for zone 1, zone 2, and zone 3, as specified in table 1074. All of the following provisions apply to crawl space walls:~~

- ~~–(a) The crawl space wall insulation shall extend vertically from the top of the foundation wall to the outside finished ground level.~~
- ~~–(b) The insulation shall also extend not less than 24 inches below outside finished ground level or a combined vertical and horizontal distance of 24 inches from the outside finished ground level.~~
- ~~–(c) Horizontal insulation extending outside of the foundation shall be covered by a protective material or by soil that is a minimum of 10 inches thick.~~
- ~~–(d) The insulated crawl space walls are included as part of the gross area of exterior walls from the top of the foundation wall to the outside finished ground level.~~
- ~~–(e) When crawl spaces below uninsulated floors are ventilated during the summer, the vent area shall be provided at a ratio of 1 square foot per 1,500 square feet of crawl space floor area. The ground surface (floor) within the crawl space shall be covered with a material that has a rating of 1.0 perm or less.~~
- ~~–(f) An insulated crawl space that comprises the building envelope and is a heated space through the existence of a positive heat supply is not required to be ventilated during the heating season.~~//

R 408.31080 Rescinded.//Building component criteria; finished lower level walls.

~~Rule 1080. The exterior walls of heated finished lower levels shall have insulation that has a thermal resistance value (R) of not less than R5 for zone 1, zone 2, and zone 3, as specified in table 1074. Both of the following provisions apply to finished lower level walls:~~

- ~~–(a) The wall insulation shall extend vertically from the top of the foundation wall to floor of the finished lower level.~~
- ~~–(b) Insulated lower level walls, including the below grade portion, are included as part of the gross area of exterior walls, if the windows and doors meet the fenestration and door requirements in R 408.31071(3) and R 408.31075.~~//

R 408.31081 Rescinded.//Building component criteria; exposed basement walls.

~~Rule 1081. The exterior basement walls comprising the building envelope shall not have an uninsulated exposed area above finished grade that is more than 7% of the gross area of exterior walls. All of the following provisions apply to exposed basement walls that are exposed more than the 7% limit.~~

- ~~–(a) Basement wall areas that are exposed more than the 7% limit shall be insulated with insulation that has a minimum thermal resistance value (R) of R5 as specified in table 1074 for zone 1, zone 2, and zone 3, until the uninsulated exposed area has been reduced to 7% or less of the gross area of exterior walls.~~
- ~~–(b) The method or area of insulating shall be at the discretion of the builder.~~
- ~~–(c) The insulated area of the basement walls are included as part of the gross area of exterior walls.~~
- ~~–(d) If insulation is placed on the exterior of a foundation supporting a masonry veneer exterior, then the horizontal foundation surface supporting the veneer is not required to be insulated to satisfy the exposed basement wall criteria.~~//

R 408.31082 Rescinded.//Air leakage.

~~Rule 1082. (1) This rule applies to locations that separate outdoor ambient conditions or exempted portions of the building from interior spaces that are heated or mechanically cooled. This rule is not applicable to the separation of interior conditioned spaces from each other.~~

~~(2) Exterior joints in the building envelope that are sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed. The areas may include joints around window and doorframes, between wall and foundation, between wall panels, or penetrations and utility services through walls, floors, and roof/ceiling assemblies that comprise the building envelope.~~//

R 408.31083 Rescinded.//Building envelope trade-off options.

~~Rule 1083. (1) A proposed building which is designed under R 408.31073, R 408.31074 to R 408.31081, R 408.31082, and this rule and which exceeds 20% fenestration and door openings of the gross area of exterior walls shall be in compliance with one of the following trade-off options:~~

~~(a) High efficiency HVAC equipment trade-off option, subrule (2) of this rule.~~

~~(b) High efficiency windows and doors trade-off option, subrule (3) of this rule.~~

~~(c) Roof/ceiling and wall trade-off option, subrule (4) of this rule.~~

~~(d) Basement insulation trade-off option, subrule (5) of this rule.~~

~~(e) Air leakage control trade-off option, subrule (6) of this rule.~~

~~(2) This subrule applies to equipment and mechanical component performance for heating, ventilating, and air conditioning systems. All of the following provisions apply to the high efficiency HVAC equipment trade-off option:~~

~~(a) With respect to warm air furnaces and combination warm air furnaces/air conditioning units, gas and oil fired comfort equipment shall have minimum efficiency levels of not less than 90% AFUE (heating) or an HSPF of not less than 7.8 and a SEER of not less than 12 for cooling equipment.~~

~~(b) Gas and oil fired comfort equipment (hot water boilers) shall have minimum efficiency levels of not less than 83% AFUE.~~

~~(c) Ground source heat pump systems shall have minimum efficiency levels of not less than 3.0 COP.~~

~~(d) Data furnished by the equipment supplier or certified under a nationally recognized certification program or rating procedure shall be used to satisfy the requirements of this subrule.~~

~~(3) With respect to high efficiency windows and doors trade-off option, openings in the opaque exterior building envelope shall have a thermal resistance value (R) of not less than R3.5.~~

~~(4) Both of the following provisions apply to roof/ceiling and wall insulation trade-off option:~~

~~(a) The thermal resistance value (R) of the insulation for the roof/ceiling assembly comprising the building envelope shall not be less than R38 in all zones.~~

~~(b) The thermal resistance value (R) of the insulation for the exterior walls comprising the building envelope above the foundation wall shall not be less than the following:~~

~~(i) R15 for zone 1.~~

~~(ii) R19 for zone 2.~~

~~(iii) R24 for zone 3.~~

~~(5) All of the following provisions apply to the basement insulation option:~~

~~(a) The exterior basement walls comprising the building envelope shall have insulation that has a thermal resistance R value of not less than R5 for all zones. The wall insulation shall extend~~

from the top of the foundation wall to the level of the basement floor. The insulation shall be an approved type for the conditions implemented. The method of insulating shall be at the discretion of the builder.

~~-(b) Insulated basement walls, including the below-grade portion, are included as part of the gross area of exterior walls if the windows and doors meet the fenestration and door requirements in R 408.31075 and R 408.31082(2).~~

~~-(c) To be eligible as an insulation trade-off option, basement walls shall be in compliance with all of the following provisions:~~

~~-(i) Be exterior walls comprising the building envelope and not supporting an insulated floor.~~

~~-(ii) Not be required to be insulated by R 408.31080.~~

~~-(iii) Be not less than 50% of the total basement wall area.~~

~~-(6) All of the following provisions apply to the air leakage control trade-off option:~~

~~-(a) Air leakage locations to be treated are openings in the building envelope between conditioned space and unconditioned space or the outside. Air leakage locations include locations that have opening, cracks, and joints, as follows:~~

~~-(i) Between wall cavities and window or doorframes.~~

~~-(ii) Between wall assemblies or their sill plates and foundations.~~

~~-(iii) Between walls and roof/ceiling or attic/ceiling seals.~~

~~-(iv) Between separate wall panels.~~

~~-(v) Penetrations of utility services through walls, floors, and roof assemblies.~~

~~-(vi) Penetrations of the wall cavities, including interior walls, through the top plates or bottom plates, or both.~~

~~-(b) Air leakage control treatment includes sealing around all plumbing and electrical penetrations, recessed lights, bathtubs, and showers and at attic, knee wall, and crawl space access panels.~~

~~-(c) Exterior joints, seams, or penetrations in the building envelope that are sources of air leakage shall be sealed with durable sealant materials or closed with gasketing systems.~~

~~-(d) When installed in the building envelope, a recessed lighting fixture shall be in compliance with either of the following:~~

~~-(i) A type IC rated, installed lighting fixture inside a sealed container constructed from appropriate fire-rated materials or other airtight assembly manufactured to house a type IC-rated lighting fixture.~~

~~-(ii) A type IC airtight or equally rated lighting fixture which is tested at 75 Pascal (Pa) (1.57 pounds per square foot) with an air leakage rating of 2.0 cubic feet per minute (cfm) or less or which is in compliance with the state of Washington restricted airflow requirements and is labeled as such.~~

~~-(e) Documentation of proposed measures providing a reduction in air changes per hour (ACH) or results of a post-construction blower-door test (0.50 ACH) may be provided to the building official to receive credit for the air leakage control trade-off option. Documentation submitted by a person licensed under article 24 of Act No. 299 of the Public Acts of 1980, as amended, being §339.2401 et seq. of the Michigan Compiled Laws, shall not be required to be prepared, sealed, or submitted by an architect, professional engineer, or other consultant.~~

~~-(7) The decision of which trade-off option to use to achieve compliance with the code shall be at the sole discretion of the builder and shall be accepted by the building official.~~

~~-(8) Electing a trade-off option does not exempt conformance with other requirements in R 408.31073 and R 408.31082.//~~

R 408.31084 **Rescinded.**~~//Residential building design by systems analysis and design of buildings utilizing renewable sources.~~

~~—Rule 1084. (1) This rule establishes design criteria, in terms of heat energy use, in a residential building, including the building envelope components. Compliance with this rule shall require an analysis of the building energy usage as a system of the building envelope components and the heating source or sources proposed, hereinafter called an “energy analysis.” A building designed in accordance with the code will be deemed as complying with the code if the calculated heating energy consumption is not more than that of a standard design building which has a building envelope designed in accordance with this rule, R 408.31073, R 408.31074 to R 408.31081, R 408.31082 and 408.31083, and which has a heating source that has an efficiency of 78% AFUE. For a proposed alternate building design to be considered similar to the standard design, the proposed alternate building design shall be the same as the standard design for all of the following:~~

- ~~—(a) Equal floor area.~~
- ~~—(b) Thermal envelope area.~~
- ~~—(c) Exterior design conditions.~~
- ~~—(d) Occupancy.~~
- ~~—(e) Climate data.~~
- ~~—(f) Usage operational schedule.~~

~~—(2) The standard building design that is in compliance with the requirements of R 408.31073, R 408.31074 to R 408.31081, R 408.31082, and 408.31083 shall be designed to include all of the following:~~

- ~~—(a) Gas and oil-fired comfort equipment that has an efficiency level of 78% AFUE.~~
- ~~—(b) An air changes per hour (ACH) rate of 0.80 for the purpose of calculation only.~~
- ~~—(c) If the proposed design takes credit for reduced ACH levels, then documentation of measures for the reduction or results of a post-construction blower door test may be provided to the building official to receive credit for the air leakage reduction. Documents submitted by a person licensed under article 24 of Act No. 299 of the Public Acts of 1980, as amended, being §339.2401 et seq. of the Michigan Compiled Laws, need not be prepared, sealed, or submitted by an architect, professional engineer, or other consultant.~~
- ~~—(d) The typical meteorological year (TMY), or its ersatz equivalent, from the national oceanic and atmospheric administration (NOAA) or an approved equivalent, for the closest available location, shall be the same for the proposed alternative design. The builder may choose a simplified heating degree day (HDD) approach for the appropriate zone, as follows:~~
 - ~~—(i) Zone 1 6900 HDD.~~
 - ~~—(ii) Zone 2 7900 HDD.~~
 - ~~—(iii) Zone 3 9300 HDD.~~

~~The decision of which method to use shall be the sole discretion of the builder and shall be accepted by the building official.~~

~~—(3) The analysis of the heating energy usage of the standard and the proposed alternative building design shall use the same methodology or calculation tool for comparison.~~

~~—(4) A proposed alternative design that is submitted as an exception to the standard design criteria shall be accompanied by a heating energy analysis comparison report. The report shall provide technical detail on the 2 building and system designs and on the data used in, and resulting from, the comparative analysis to verify that both the analysis and the design meet the~~

criteria of this rule, R 408.31085, and R 408.31086. A report submitted by a person licensed under article 24 of Act No. 299 of the Public Acts of 1980, as amended, being §339.2401 et seq. of the Michigan Compiled Laws, to a building official shall not be required to be prepared, sealed, or submitted by an architect, professional engineer, or other consultant.//

R 408.31085 Rescinded.//Renewable energy source analysis.

~~–Rule 1085. (1) A proposed building that utilizes renewable energy sources for all or part of its energy source shall be in compliance with the requirements of R 408.31084, except that the renewable energy may be excluded from the total heating energy consumption allowed for the building.~~

~~–(2) To qualify for the exclusion specified in subrule (1) of this rule, a renewable energy shall be derived from a specific collection, storage, or distribution system.~~

~~–(3) The criteria specified in R 408.31084 shall apply to the proposed alternative designs that utilize renewable sources of energy.~~

~~–(4) The heating energy derived from renewable sources and the reduction in conventional heating energy requirements shall be separately identified from the overall building energy use.~~

~~–(5) Supporting documentation on the basis of the performance estimates for the renewable energy sources shall be submitted to the building official.~~

~~–(6) If a person licensed under article 24 of Act No. 299 of the Public Acts of 1980, as amended, being §339.2401 et seq. of the Michigan Compiled Laws, submits the documentation specified in subrule (5) of this rule, then a building official shall not require that the documentation be prepared, sealed, or submitted by an architect, professional engineer, or other consultant.//~~

R 408.31086 Rescinded.//Heating energy analysis comparison report.

~~–Rule 1086. (1) This rule provides a minimum requirement for a heating energy analysis comparison report. This rule provides flexibility to permit the use of innovative approaches and techniques.~~

~~–(2) A comparison report shall include a basic description of the proposed alternate building design and shall identify any exceptions to the standard design criteria.~~

~~–(3) The abbreviated report form 1086.3 may be used to compare a proposed alternative house with a standard design house that is in compliance with this rule through the systems analysis method. The standard design house uses the same total area of each building envelope component from the proposed alternative house. If the proposed alternative house A/R total (line 14 or line 17 of form 1086.3) is less than or equal to the standard design house (line I or line L of form 1086.3), then the house is in compliance with the code.~~

~~–(4) Alternative standard design constants (table 1086.4) may be used for the specific site weather data (heating degree days) of the proposed alternative house location.~~

~~–(5) Abbreviated report form 1086.3 reads as follows:~~

~~–(6) Table 1086.4 reads as follows:~~

Abbreviated Report Form 1086.3 Energy Analysis Comparison Report

Builder's Name:
Project Address:
City/Township/County:

PROPOSED ALTERNATIVE HOUSE		STANDARD DESIGN HOUSE	
ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS	ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS
$A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 + A_3 / R_3 =$ Total Roof/Ceiling Area _____ Line 1	 	$Z_1 0.036$ $Z_2 0.032$ $Z_3 0.030$ Total Roof/Ceiling Area _____ Line A	
GROSS WALL		GROSS WALL	
Opaque Wall (Does not include band joist, windows, doors, etc.) $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$ Line 2			
Band Joist $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____}$ Line 3			
Fenestration and Doors, Windows $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 + A_3 / R_3 =$ Line 4			
Doors $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$ Line 5			
Other $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____}$ Total Gross Wall Area _____ Line 6			
GROSS WALL SUBTOTAL A/R (Lines: 2+3+4+5+6) Line 7		$Z_1 0.16$ $Z_2 0.15$ $Z_3 0.13$ Total Gross Wall Area _____ Line B	

Abbreviated Report Form 1086.3
Energy Analysis Comparison Report
Continued

FOUNDATION/FLOOR	SUBTOTALS	FOUNDATION/FLOOR	SUBTOTALS
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Floors Over Unconditioned Spaces $A \text{ _____ } / R \text{ _____ } = A/R \text{ _____ } =$ <div style="text-align: right;">Line 8</div>	Floors Over Unconditioned Spaces $Z_1 0.05$ $\text{_____} \times Z_2 0.05 =$ Total Floor Area $Z_3 0.033$ <div style="text-align: right;">Line C</div>
Slab on Grade Floors (Area = Perimeter x 2') $A \text{ _____ } / R \text{ _____ } = A/R \text{ _____ } =$ <div style="text-align: right;">Line 9</div>	Slab on Grade (Unheated) $Z_1 0.17$ $\text{_____} \times Z_2 0.15 =$ Total Slab Edge Area $Z_3 0.13$ Slab on Grade (Heated) $Z_1 0.12$ $\text{_____} \times Z_2 0.11 =$ Total Slab Edge Area $Z_3 0.10$ <div style="text-align: right;">Line D</div> <div style="text-align: right;">Line E</div>
Crawl Space Walls (Area: Top foundation wall to average finished grade) $A \text{ _____ } / R \text{ _____ } = A/R \text{ _____ } =$ <div style="text-align: right;">Line 10</div>	Crawl Space $Z_1 0.16$ $\text{_____} \times Z_2 0.15 =$ Total Crawl Space Wall Area $Z_3 0.13$ <div style="text-align: right;">Line F</div>
Basement Walls (Area: Top foundation wall to average finished grade) $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____ } =$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____ } =$ $A_1 / R_1 + A_2 / R_2 =$ <div style="text-align: right;">Line 11</div> Basement Windows $A \text{ _____ } / R \text{ _____ } = A/R \text{ _____ } =$ <div style="text-align: right;">Line 12</div> Total Gross Basement Wall Area	Basement Walls $Z_1 0.16$ $\text{_____} \times Z_2 0.15 =$ Total Gross Basement Wall Area $Z_3 0.13$ <div style="text-align: right;">Line G</div>
FOUNDATION/FLOOR SUBTOTAL A/R (Lines: 8+9+10+11+12) <div style="text-align: right;">Line 13</div>	FOUNDATION/FLOOR SUBTOTAL A/R (Lines: C+D+E+F+G) <div style="text-align: right;">Line H</div>
PROPOSED ALTERNATIVE HOUSE SUB-TOTAL A/R (Lines: 1+7+13) <div style="text-align: right;">Line 14</div>	STANDARD DESIGN HOUSE SUB-TOTAL A/R (Lines: A+B+H) <div style="text-align: right;">Line I</div>
HEATING EQUIPMENT EFFICIENCY (If the same as Standard House, go to line 16 or 17) (Oil or Gas Fired) AFUE: _____ % Line 14: _____ = Adjusted A/R = AFUE: 0. _____ <div style="text-align: right;">Line 15</div>	HEATING EQUIPMENT EFFICIENCY (Oil or Gas Fired) AFUE: 78% Line I: _____ = Adjusted A/R = AFUE: 0.78 <div style="text-align: right;">Line J</div>
AIR LEAKAGE RATE (If the same as Standard House, go to line 17) $\text{_____} \text{ ACH} \times \text{_____} \text{ ft}^3 \times 0.018 =$ Air Changes per Hour Volume of House <div style="text-align: right;">Line 16</div>	AIR LEAKAGE RATE $0.8 \text{ ACH} \times \text{_____} \text{ ft}^3 \times 0.018 =$ Volume of House <div style="text-align: right;">Line K</div>
PROPOSED ALTERNATIVE HOUSE TOTAL (Lines: 15+16)	STANDARD DESIGN LIMIT TOTAL (Lines: J+K)

Equal to or less than line L to pass

Line 17

Line L

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~~//Alternative Standard Design Constants (1/r)
for Systems Analysis Approach~~

Heating Degree Days	6000— 6499	6500— 6999	7000— 7499	7500— 7999	8000— 8499	8500— 8999	9000+
Roof/Ceiling	0.038	0.036	0.034	0.032	0.030	0.030	0.030
Gross Wall	0.20	0.16	0.15	0.15	0.14	0.14	0.13
Foundation/floor Floor over unconditioned space	0.05	0.05	0.05	0.05	0.033	0.033	0.033
Slab on grade Unheated slab	0.18	0.17	0.16	0.15	0.14	0.13	0.13
Heated Slab	0.13	0.12	0.12	0.11	0.10	0.10	0.10
Crawl space	0.20	0.16	0.15	0.15	0.14	0.14	0.13
Basement wall	0.20	0.16	0.15	0.15	0.14	0.14	0.13

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